Analysis of Particulate-Bound Nutrients in Urban Stormwater

Bethany Madge
Environmental Engineer
Urban Watershed Management Branch
Water Supply and Water Resources Division
National Risk Management Research Laboratory
Office of Research and Development
(732) 906-6823
madge.bethany@epa.gov

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Nutrients are important players in the degradation of water bodies because they are the key factors controlling eutrophication. Eutrophication causes unsightly algal blooms leading to oxygen depletion, stress on or loss of aquatic life, and unpleasant odors. The study of nutrients has focused on nitrogen and phosphorus due to a general belief that phosphorus is the limiting factor in freshwater bodies, while nitrogen is the limiting factor in saline or sea waters. Because urban stormwater runoff has been identified as a prominent source of nutrient pollution, nutrient removal is essential for proper design and function of stormwater best management practices (BMPs).

Sedimentation and subsequent burial is often cited as a major removal mechanism for both phosphorus and nitrogen in common BMPs, such as retention ponds. However, no known research has been conducted on the size relationship of particle-bound nutrients in urban stormwater. Characterizing particulate phosphorus and nitrogen by size and species will enable more accurate sedimentation modeling of these nutrients. This, in turn, will aid in urban stormwater BMP design for nutrient management. Thus, the primary objective of this study is to determine the distribution of particle-bound phosphorus and nitrogen species throughout the size range of suspended solids typically found in urban stormwater.

For the study, three storms per season will be sampled from a high-density residential area in Staten Island, NY. All 12 stormwater samples will be filtered to separate the stormwater particles into five size fractions. These size fractions will be analyzed for phosphorus and nitrogen species, including bioavailable phosphorus, which is rarely, if ever, measured in stormwater, but is a key component in producing the undesired effects associated with eutrophication. Temperature, pH, hardness, total suspended solids, and particle size distribution will also be measured in unfiltered stormwater. To date, two stormwater samples have been collected and sampling is currently ongoing. Project setup, laboratory methods, field sampling experiences, and preliminary results are to be presented in the poster.